Short Winter Course - 1901

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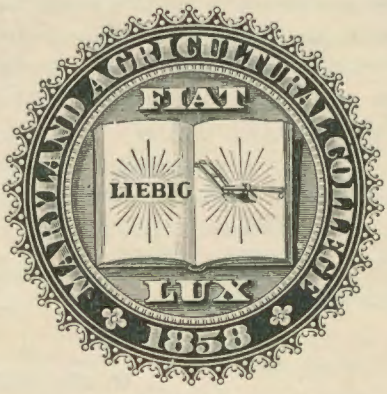

Characteristics of the Soil.

W. T. L. Taliaferro,
Prof. of Agriculture.

To the Teachers of Maryland:—

We have commenced Nature Study, to continue it until every rural school in Maryland has taken up the cause and has begun to give to the children of our country communities their rightful heritage—a knowledge of the laws of Nature operating around them, in order that their lives may be more resourceful from the standpoint of mental activity and its natural consequence—a contentment, now foreign in almost every such environment.

We feel that we can depend upon you to aid us in this most important work. The Editor of the Quarterly will be very glad to correspond with any teacher who wishes information concerning any of the features of this development from all sides. We insert in this issue some cuts showing our facilities for giving to all satisfactory answers to such queries as may be propounded. We are well equipped for the work from the standpoint of ability, and the pleasure we find in furthering the cause which is so dear to all interested in rural development,

With much respect and esteem,

Very truly yours,

R. W. SILVESTER, President.

CHARACTERISTICS OF THE SOIL.

PHYSICAL COMPOSITION.

By W. T. L. Taliafero, Professor of Agriculture.

Note: These leaflets are for teachers, not for pupils. It is not intended in them to treat the subject with thoroughness, or give directions for teaching. They are meant only to invite attention to some of the most important facts connected with the soil, and to suggest methods whereby they may be impressed upon the minds of children. Although, in the leaflet the facts are first stated and then illustrations given, it will probably be found better in teaching, to make the illustrations first, and deduce the facts from them.

The soil is partly physical and partly organic. The organic matter of the soil consists of the partially decomposed remains of plants and animals, and is consequently combustible. It is brown or black in color, and gives to soils their dark appearance.

The mineral part of the soil consists of fragments of rock more or less minutely divided. It is incombustible and varies in color according to the kind of rock from which it is derived.

Illustration No. 1. Heat a sample of ordinary soil and it will darken in color owing to the charring of the organic matter contained in it. Heat to a dull red heat, and keep it at that for a few minutes. The organic matter will be burned out, leaving the incombustible mineral portion, which, on cooling, will be lighter in color than the original soil. Compare the charring, burning and incombustible ash residue of a splinter of wood. An easy way to burn a little soil is to spread it thinly on a shovel and put it on a hot bed of coals.

Illustration No. 2. Spread a little soil thinly on a sheet of paper and examine closely, if possible with a magnifying glass. The larger grains will be clearly distinguishable as small rock fragments. Rock fragments vary in size from huge boulders to particles so minute that they cannot be distinguished with a high power microscope. Only the smaller fragments are considered as forming soil.

Illustration No. 3. Put a small handful of soil in a clear glass tube or narrow jar. Fill the tube three-fourths full of water, and shake thoroughly for five minutes. Let it settle and watch while settling. The largest particles will settle first as gravel; then the next smaller, as coarse sand; then the fine sand, and, finally, the fine particles of silt and clay.

Illustration No. 4. A separation of different sized soil grains may easily be made as follows: Sift a small quantity of soil through a coarse seive to take out the gravel, if any be present. Then sift through a fine seive to take out the coarse sand. Put the remainder in a jar three-fourths full of water and stir vigorously for five minutes, (a jar which can be closed and shaken is better). Let it stand for one minute and then pour carefully into a second jar, leaving the sediment in the first jar undisturbed. Shake the contents of the second jar vigorously for five minutes, and after allowing it to stand for five minutes, pour carefully into a third jar, leaving the sediment undisturbed. Evaporate the water from jar three. The sediment will be the finest soil grains which we may call clay. Dry the sediment in jar two. It will consist of grains a little larger than those in jar three, and may be called silt. Pour fresh water in jar one, and shake and pour off as before. Repeat this till the water comes off clear. The last sediment will consist of larger grains than those in jar two, and may be called fine sand. (Jar two may be treated in the same way, but it will probably take some time.) Put each of these five separations in a vial and keep for reference.

Note: Soil for a separation like the above should preferably have the organic matter first burned out. If that cannot be done, select a sub-soil or one containing as little organic matter as possible. A tablespoonful of soil may be burned at one time on an ordinary fire shovel over a hot fire, and two or three tablespoons is sufficient for such a separation, or mechanical analysis as described above. A few drops of ammonia added to the water will aid in the separation.

Soils differ very much in the comparative amounts of large and small grains which they contain. They are called by farmers, gravelly, sandy or clay soils, according as gravel, sand or clay predominates. Those which contain sand and clay mixed are called loam soils and vary from sandy loams to clay loams.

The fertility of soils depends in great degree upon the size of the soil grains which compose them.

SOIL WATER.

There can be no life without water. Plants in their growth require a very large amount of water, much more than is commonly supposed. It has been found that ordinary plants require between three and four hundred pounds of water to make one pound of dry material. Plants that grow in the earth get their water from the soil through their roots. Even some plants which grow in the air attached to trees and rocks, and get their water from the air, have aerial roots through which to absorb it.

A part of the water used by plants is consumed in building up their dry material. A part, and much the larger portion, is required to bring food to the plant. Plants cannot move about like animals in search of food, but depend upon the winds and soil water to bring it to them. Plants feed upon gasses and liquids; they cannot feed upon solids. Through their leaves they feed upon carbonic acid gas, which the winds bring them, and through their roots, they feed upon water and substances which the water dissolves from the soil and brings to them. After this water has given to the plant the food which it contained, it passes off through the leaves by evaporation.

Illustration No. 1. Dissolve in a tumbler of water, as much sugar as it will take up. Fasten a wire around the tumbler in such a way, that one end will be a few inches above the top, and from this end suspend a lamp wick, so that the lower end will be an inch or two below the surface of the water in the tumbler. Set aside for a few days in a dry place, preferably in the wind.

The water will rise in the wick and be evaporated, leaving in the wick the sugar which it contained. As fast as the water is evaporated from the wick, more water will rise into it, bringing more sugar and leaving it there by evaporation, until after a few days the wick will be crusted with sugar.

Arrange another tumbler with wire and wick, in the same way, but fill with dry sugar. So long as the sugar remains dry, none will rise in the wick.

The roots of plants absorb water and the plant food contained in it in the same way that the wick absorbed the water and sugar.

Plant and animal membranes, under certain conditions, have a wonderfully strong absorbent power.

Illustration No. 2. Fill a small test tube or vial with a strong brine. Tie a piece of thin bladder over the top, so that when the vial is inverted, no brine can escape. Invert the vial in a tumbler of fresh water. After some hours the water in the tumbler will be salty, showing that the membrane has absorbed some of the brine and passed it on into the fresh water; and the bladder over the mouth of the vial will be distended, showing that it has also absorbed fresh water and passed it on into the brine, in greater quantity than it passed the brine out. This absorption and passing of liquids by membranes is called osmose. The osmotic power of roots is very great; they pump water into the plant with such force, that the pressure of the water in the plant cells, keeps them distended, and stiffens the leaves and young twigs. This is an important function of water in plants.

Illustration No. 3. Cut three flowers or other plants with stem and leaves. Put one in a vase of water, one in an empty vase, and wrap one tightly in parafine paper. The water will soon evaporate from the leaves of the second and none being supplied by absorption through

the stem, they will wilt. The first and third will remain fresh for some days; the first, because the water lost by evaporation is made up by absorption through the stem; the third because evaporation is checked by the wrapping.

The flow of sap from a cut vine and the bursting of buds in spring are due to osmotic pressure.

To illustrate the amount of water evaporated through the leaves of plants take up some leafy plant, with as much roots as possible. Gently shake or wash off some of the earth and before the roots have dried place in a rather narrow clear glass jar. Cover the roots with water and set in the wind. Fill a similar empty jar with water to the same height, and place by the side of the first. Note from day to day the difference in the height of the water in the jars. This difference represents the amount of water evaporated through the leaves. Calculate the amount evaporated from an acre of land covered with plants.

These facts show the necessity for an abundance of water in the soil for the proper development of plant growth, and the importance of saving, for the use of our crops, the rain which falls upon the earth.

Deserts are barren, not for lack of plant food in the soil, but for lack of water to make it available. Millions of acres of desert lands have been made to produce abundant crops when water has been supplied by irrigation.

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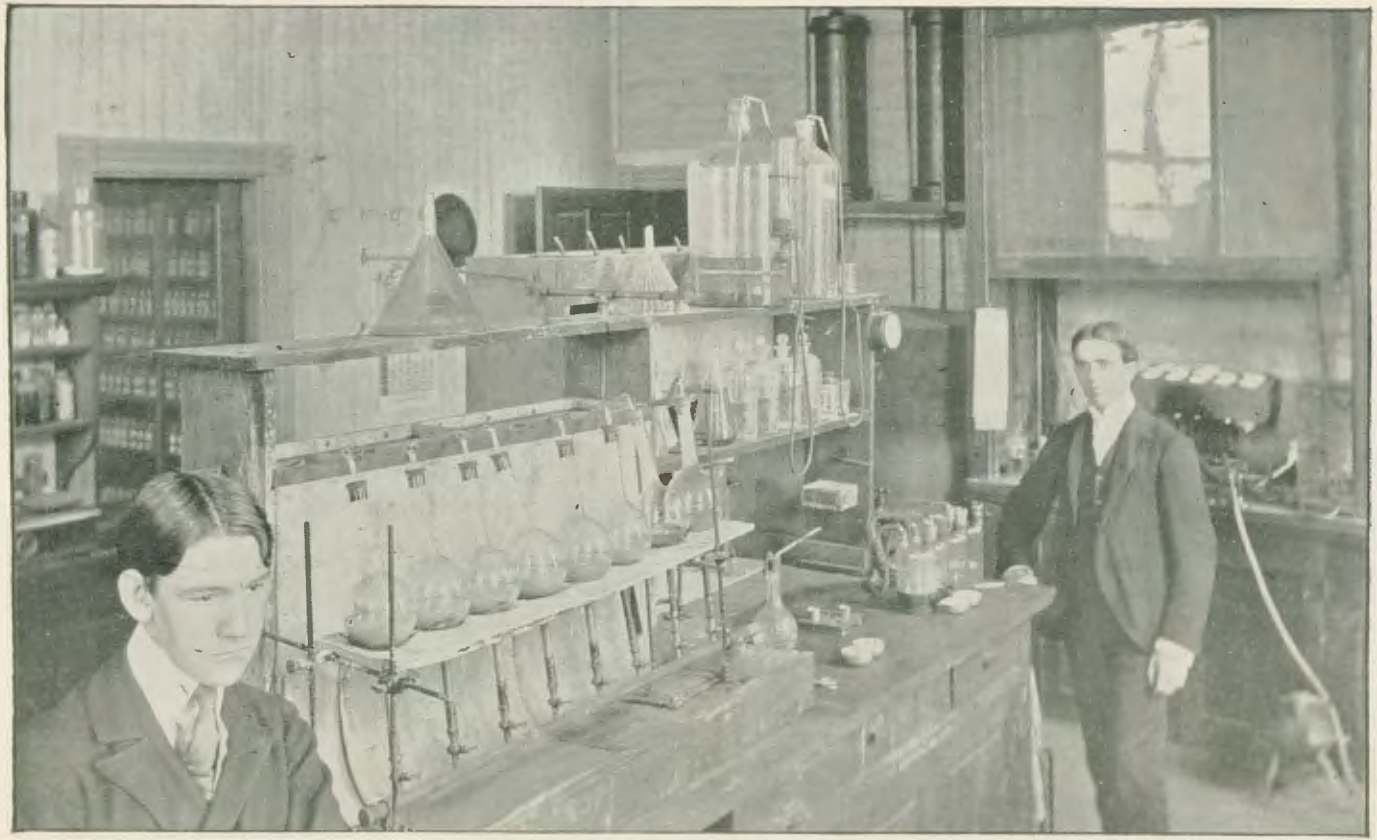
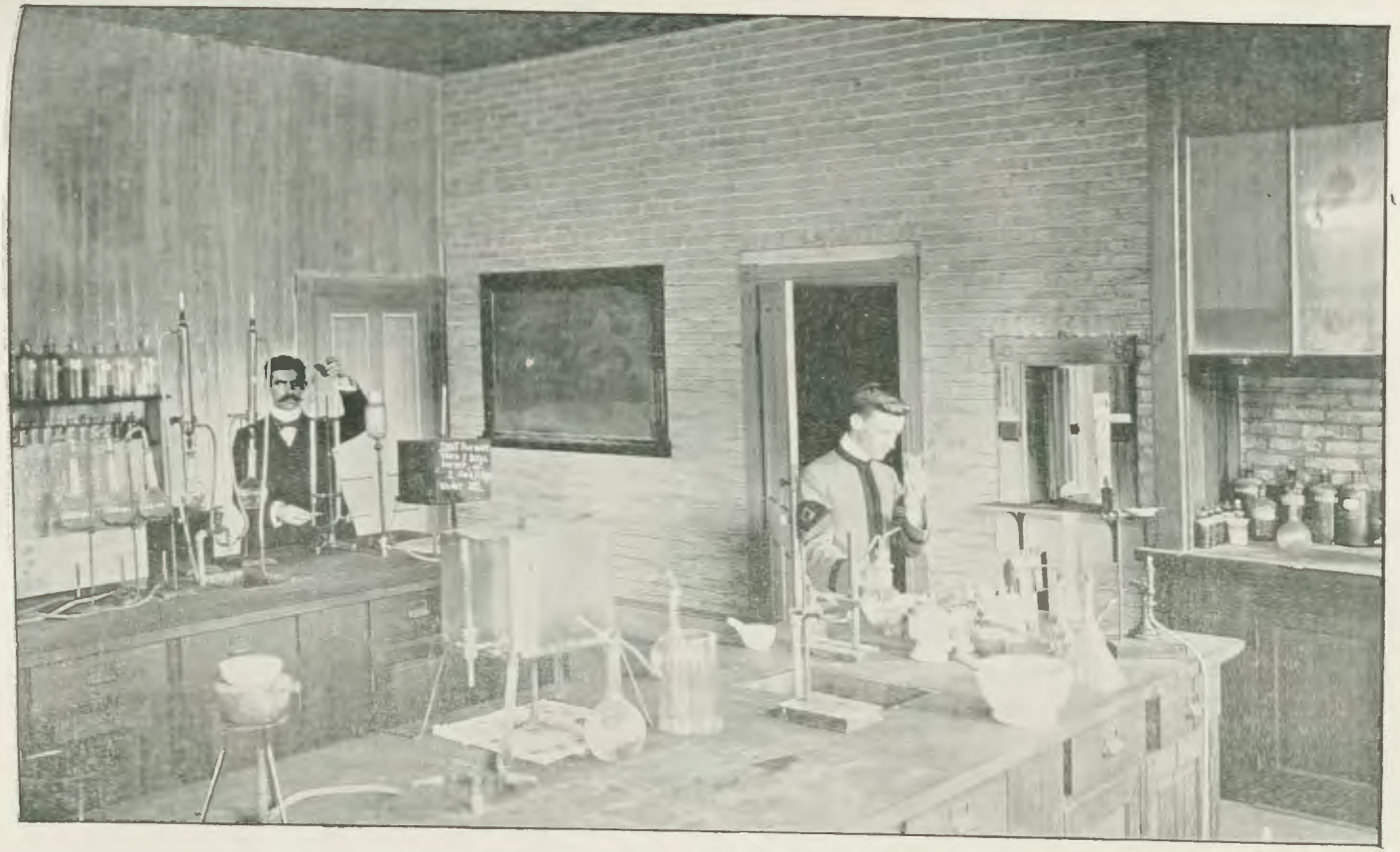
R. W. SILVESTER,
President Maryland Agricultural College.
College Park, Md.



Chemical Laboratory for Nitrogen and Potash Determinations—State Work.

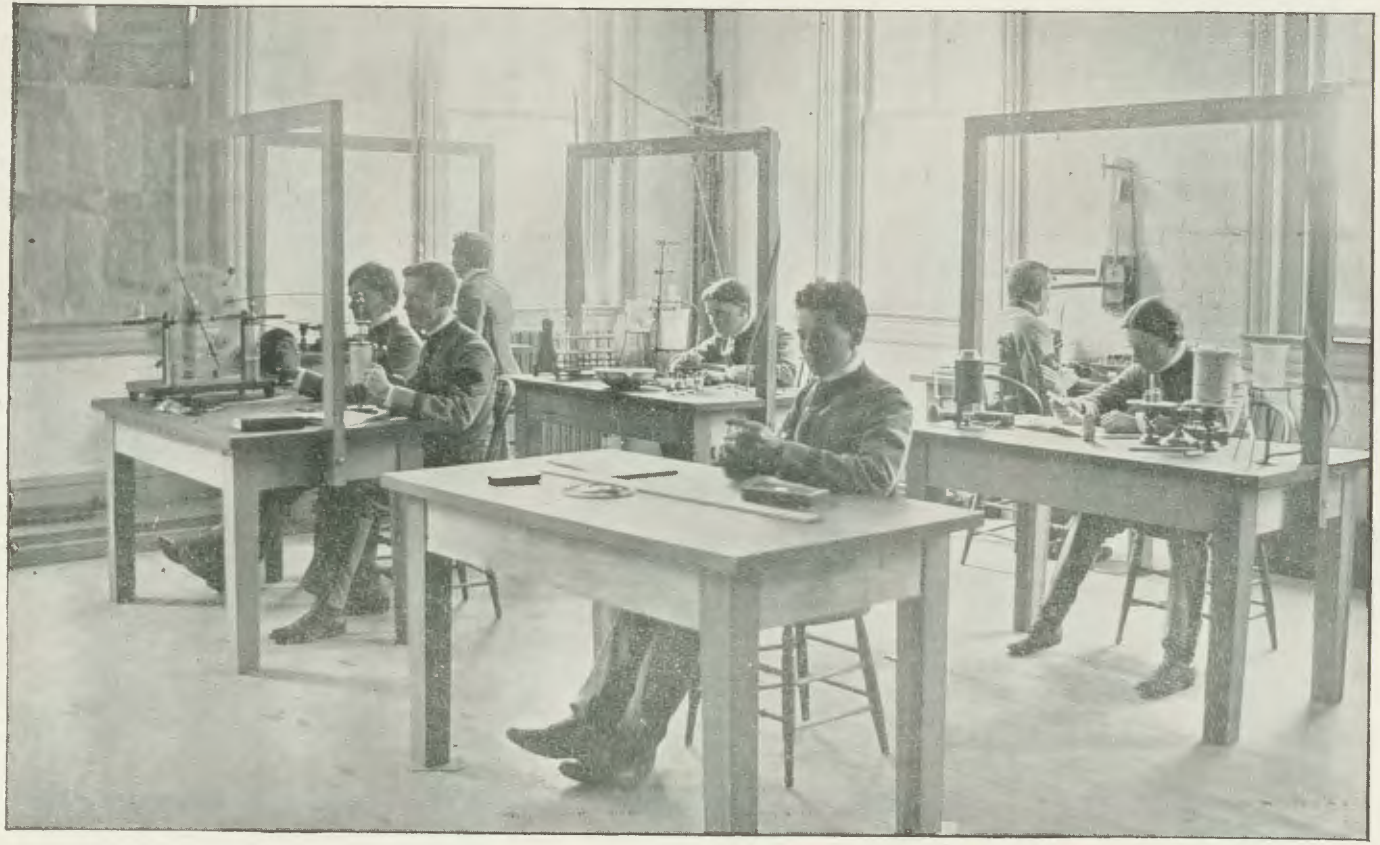
Botanical Laboratory— Students at Work.



Junior Chemical Laboratory—Section of Class at Work.

Entomological Laboratory—Students at Work.

Office and Private Laboratory of the State Chemist.



Physical Laboratory—Students at Work.

Sophomore Chemical Laboratory—Class at Work.